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ABSTRACT

Using a case study approach, this study focuses on a physical science teacher's method of pacing instruction and the use of target students. This report includes an examination of: (1) the teacher's perceptions of the target students in the science class; (2) possible reasons for certain students being target students; and (3) types of questions that students received. With the intention of obtaining information on the basic management of the classroom, the investigation centered on what patterns of turn taking exist in a ninth-grade physical science classroom. Also reviewed are the views of the observed teacher and an analysis of the teacher's behavior based on observational data and the perceptions of the teachers. Implications for instruction and research are discussed. (ML)

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TARGET STUDENTS IN THE SCIENCE CLASSROOM: A CASE STUDY

David A. Cline

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Target Students in the Science Classroom: A Case Study

ABSTRACT

This is a report of a case study of a physical science teacher and his methods of pacing instruction in one ninth grade class. When conducting the lesson, the teacher relied upon a limited number of students for answers to questions, especially questions which served as transition points, from one topic or point to the next. In the literature, these students on which the teacher relies for pivotal actions are called the "steering group" (Dallahof, 1971; Lundgren, 1972) or "target students" (Tobin, 1985). This report describes one teacher's use of target students and examines possible reasons for the patterns that the teacher used in calling upon students. Through a qualitative analysis, the teacher was found to be calling on a limited number of students in the class and of those students there were two subgroups: those receiving basic questions, and those students that received questions requiring a higher level of sophistication of thinking.

This report also examines three other findings of the study: (1) the teacher's perceptions of the target students in the science class, (2) possible reasons for certain students being target students, and (3) types of questions that students received. The teacher's perceptions provided an interesting paradox. Although the teacher was observed on several occasions calling on a very few students in a class period, he routinely denied calling on these students more than others. When the teacher was interviewed about certain students that had been identified as targets, there appeared to be few links such as prior acquaintence that would cause them to receive more attention than others. Several of the target students were not included on the teacher's list of the most able students. As with the questions that the students were asked, it seemed that a few of the target students received questions of a higher level of sophistication. The average student in the class, when given the opportunity to answer a question, was asked a factual recall question, but target students were asked application, synthesis, or analysis questions. The teacher claimed to be oblivious to these differences.

This article lends support to the work of Gallagher and Tobin (1985) done in the United States and Australia on target students. The implications for science teaching are important. First of all, when science teachers depend on target students to answer the bulk of the questions during a lab session they are reinforcing the myth/truth that science tends to be an elitist subject in which each further advanced class of study skims the top students from the previous class until there are but a select few that remain.

The second implication is that teachers that rely on such a strategy for instruction are in effect managing time, but not teaching. These teachers provide tasks which are worked on by the class and

then reviewed by the few. Teachers with target students do not acquire information about the achievement of the entire class, but only the accomplishment of the few target students.

The final section of this report presents the views of the observed teacher. When the teacher was asked to describe his questioning patterns his perception was that he was being equitable to all students. When the teacher was shown transcripts and frequency diagrams representing questioning patterns to target students his reaction was that the information was not representative of a typical class even though data had been collected tri-weekly during a period lasting sixteen weeks. The report of this study ends with an analysis of the behavior of the teacher from the teacher's point of view in light of which contrasts observational data and perceptions of the teacher.

INTRODUCTION

For the purposes of this research I have chosen to examine patterns of turn taking among teacher and students in a science classroom. My major research question is, "What patterns of turn taking exist in a ninth-grade physical science classroom?"

Subquestions of this major question include, "How is talk time negotiated between teacher and student?" "How does the teacher determine who to call on?" "Do some students get more questions/talk time than others?" "What factors determine who the teacher calls on in class?" I should note that I am assuming at the outset that the teacher is the person in the classroom that is in charge of determining who does the speaking. I may find that this is a shared responsibility and the teacher may not be totally in charge of choosing and passing out the turns.

By looking at how talk time is negotiated as outlined in the first question I hope to get some information on the basic management of the classroom. I originally had in mind to look at how teachers call on students. In the management realm, I am interested in how the teacher gets signals from the students that they wish to respond in class. Do the students raise their hands, or do they call out? Does the pattern remain consistant, or is the pattern fluid according to the flow of the lesson? If the pattern is not consistant when do the changes occur?

By observation I also want to look at how the teacher determines who to call on in class. Does the teacher just call on those that want to talk? Are there any random patterns? Are there other factors to consider? An outgrowth of this question is the next one, "Do some students get more questions/talk-time than others?" Does this particular teacher have favorite students? Does it show in his teaching? Can an observer pick up on these patterns and get an indication as to what makes these students more desireable when compared to others?

The patterns of turn taking may be an outgrowth of my interest in the work of Dr. Kenneth Tobin of the Western Australian Research Institute. Tobin (1985) describes a phenomenon that he

calls targeting. Targeting and the term target student refers to certain students receiving more attention then others during the course of a class period. In his work Tobin identifies two major types of target students. The first catagory of target students are those that are identified by the teacher and the teacher initiates conversation towards the students. The second major type of target student is a student that initiates the conversation towards the teacher by asking questions or by making comments on every stage of the instruction process.

The amount of time that a particular student receives in a class period certainly seems to me to be a relative one. In my own mind I answer the qustion of attention by observation over time in much the same way one talks about weather and climate. One observation in this classroom and the questioning patterns would give me an example of the "weather" of the class on that day. By spreading my observations over a period of time I believe that I have taken a sample to give me an indication of the "climate" of this class period.

Through the process of reflective thought, my questions, however general that they may be, have given me a place to begin my study. I feel that the target student phenomenon, called the steering group in some literature (Dallahof, 1971; Lundgren, 1972), is a topic that should be given some careful consideration and analysis.

It is the intent of this endeavour to peer into this classroom, to immerse myself into the culture to see if I can identify patterns as described by Tobin and Gallagher (1985) in their writings or to find evidence to the contrary that will serve to weaken some of the claims they have made. At this point for all I know the patterns that I have read about may be indiginous only to Western Australia.

OVERVIEW OF THE SETTING

On the outskirts of a a large midwestern city lies the small community of Village. Village is like most of the towns that one encounters in the midwest; an older downtown section surrounded by the newer fast-food places and auto dealerships with farms further out. One might guess that the schools play an important unifying role in the educational/ social aspect of the community and there is probably an even mix of urban and rural students with farming and factory work being the predominant occupations of the parents of school age children. I felt as if I had found a mirror image of the town that I had lived in as a beginning teacher in suburban-rural Indiana.

As it is so many times with first impressions, mine were almost totally wrong. The only thing that I had right was the description of the layout of the town. The school does rest in a fairly rural location, however the population that the school serves is less than 10% agricultural as the main means of income. The remaining 90% of the student population comes from subdivisions from the

outskirts of the larger city. The students have parents that are professional people, skilled workers, craftsmen, service people, and a few factory workers. The old saying about judging a book by it's cover comes to mind.

For this study I limited my observations to one of the two buildings in the high school complex. The physical science classroom is housed in a ninth grade building separate from, but adjacent to the main body of the high school, and the high school building proper. I have been involved in another research project in these two schools throughout the 1984-85 school year and therefore I am known by the faculty and staff and my questioning attitude is expected. Most of the teachers, students, and administrators freely talk with me and share information that others might not be privy to.

In the state of Michigan, as I understand it, there is no requirement that students graduating from high school have any science classes. In Village, there was a time when the recommendations of the state was the policy that the town followed. A few years ago the board of education suggested, voted on, and passed a rule that graduating seniors would have a credit in science. In the past two years as a result of the nationwide cry for excellence in education (A Nation at Risk, 197)in regard to science and math another credit of science was required by the school board for graduating seniors. The community has pride in its progressive way of doing things.

Having been involved in a research project in Village, I had met Mr. Smythe. Mr. Smythe is a very interesting and complex individual that I will describe in detail later. I had discussed the plans that I had with Mr. Smythe and he agreed to work with me on this project. Mr. Smythe suggested that it would look good on his personal record if it indicated that he had participated in a research project with Michigan State University. Mr. Smythe and I drew up an agreement and signed it. I then took the agreement to the building principal and discussed the project with him. The principal responded with, "Just let us know what we can do to help you." Entry into the site was complete.

The first information that I wanted to collect was about the students. Who are the students that take science in Village? The obvious answer is everyone. Who determines what classes that the students take? The answer to this question is not quite so obvious.

At the end of the eighth grade year things start to get interesting for the prospective high school freshman. Choices have to be made and the direction that the student chooses has an effect on the number of science classes that the student takes.

Early in the spring of the student's eighth grade year the principal of the middle school along with the principal of the ninth grade building and the ninth grade counsellor arrange for an *en masse* meeting of parents, students, and some teachers to discuss the transition to high school and to sketch out a four year plan for the students. At or about this time students meet with the eighth

grade counsellor to determine what science class they will take for their first year of high school.

Incoming freshmen have a choice of two science classes; physical science or general science. Physical science covers topics relating to chemistry in one semester and topics of physics in the remaining semester. Physical science is considered to be a college prep course and is taken by about half of the incoming students. The other half of the students take general science. General science covers topics of life science, ecology, nutrition, earth science, and some of the topics introduced in physical science.

How does a student choose which class is right to take? Upon interviewing the middle school counsellor I was told that there are three factors that determine placement. First of all, science grades from the eighth and seventh grade years are inspected. Informally, students are expected to have a grade of C or better in seventh and eighth grade science to be considered for physical science. The second indicator is the student's score on the science section of the Stanford Achievement Test. Again, informally, the students should have a score of 8.4-8.5 or above to consider taking physical science. The third consideration in the choice of the student is the recommendation of the eighth grade science teacher. Sometimes students that do not meet the first two criteria are admitted on the recommendation of the teacher alone. The counsellors that were interviewed said that there are usually a few cases of students each year that take the physical science without the expected grade or test score. Most survive, but a few are moved to general science at the semester break of the freshman year. The choice of a science class also has some effect on the student's math choice. While not required, algebra is recommended for the student that takes physical science.

To sum all of this up, we can see that the community is made up of people that see the importance of science in the curriculum. The community has pressured the school board to require two credits of science for graduation from high school while the state of Michigan requires none. The school offers two science courses for the incoming ninth-graders, physical science for the better students and general science for the less able or less interested.

The point that is being made by this lengthy description of the setting and the students is to show that the students that are to be observed in the physical science class are some of the best that the incoming freshman class has to offer. This assertion was confirmed by the building principal, the ninth-grade counsellor, and the classroom teacher.

The students have been identified, the school has been described, and the educational climate of the school and the community has been presented. The only information left to be given is the particulars of the teacher in the setting. So, without any further ado, let me introduce Mr. Smythe.

The motto and philosophy of Mr. Smythe might be "taste and enjoy from the banquet of life". Mr. Smythe is a tall man, in his late thirties, that has been teaching for about fifteen years. In this school Mr. Smythe teaches general and physical science classes. His major field of study as an

undergraduate was agriculture, but since he started teaching he has taught from his minor of science. Mr. Smythe also has a master's degree to round out his undergreduate certificate that allows his teaching license to state eligibility to teach grades one through twelve. "I've got a little bit of everything," he has told me on many occasions.

Mr. Smythe's personal life is as diverse as his teaching license. Mr. Smythe is, a pilot with his own plane, a farmer with a large farm that raises horses and sheep as well as planted crops, an officer at the state level of the Michigan State Teacher's Association, an investor in a series of producing oil and gas wells in Texas, and an officer at the state level in a quarter horse association. To top all of this Mr. Smythe is continually working to improve his own skills and knowledge. Evidence to support this contention comes from the knowledge that Mr. Smythe purchased a personal computer-"...you know, for doing grades and farm finances." and during the time of my observations Mr. Smythe started and passed his instrument flight rating for his pilot's license. Mr. Smythe certainly leads a full and rich life.

Lest I paint a picture of Mr. Smythe as the super teacher there should be noted that Mr. Smythe does have a couple of insecurities. The first comes from his lack of physical sciences in his science background. It was confided to me that there was little physics in his undergraduate training and none in his master's program. This is coupled with another problem; this year is the first year that the school system has used a new physical science textbook. Consequently, Mr. Smythe has no notes or prior experience to guide him through the text in its presentation. In this case, Mr. Smythe was forced into a better teaching strategy of question asking and class discussion and out his typical pattern of textbook usage which sometimes has bordered on overreliance.

DESCRIPTION AND INTERPRETATION

To begin this section, a brief description of Mr. Smythe's room should be given. This will help the reader to visualize the arrangement of the room and see how location in the room plays an important role in some of the assertions.

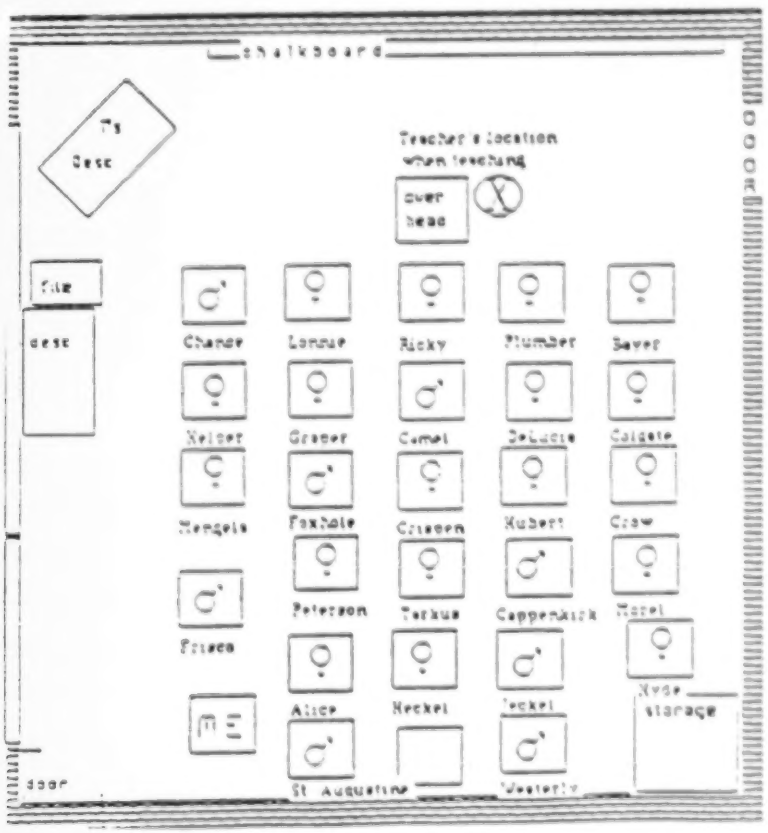
Mr. Smythe's room is rectangular, almost square. In the right front corner of the room is a door through which one enters the classroom. Along that same wall there is a small corkboard. The front wall of the room has a chalkboard with a wooden frame and a chalk ledge as found in most older schools. The back wall of the room has a large bulletin board that stretches to cover most of the available space. The back wall also has a door that leads to a storage room that houses cleaning supplies and seldom used materials. The wall opposite the entry door has windows that extend for the entire length of the room.

Mr. Smythe has finished the room in the typically sparse manner for a high school. In the front

corner of the room opposite the door is his desk and filing cabinet. Next to the filing cabinet is another desk that is used by a student aid when she grades papers. The right rear corner of the room also contains a free-standing storage unit.

Perhaps crucial and key to my study is the location of Mr. Smythe's overhead projector. It is from this point that the bulk of Mr. Smythe's teaching is done. The position of the overhead has had some effect on my study. The only other item of interest is the pull down screen that is positioned behind the overhead afixed to the wall. (same wall as the chalkboard.)

As an item of interest it must be noted here that during Christmas time this building had a contest in which students worked as a group to decorate rooms in the school for a pizza party to be given to the group that presented the best decorated room. The fourth hour class that I observed decorated Mr. Smythe's room and won the party. I saw the decorations before Christmas when I was in the negotiation stage with the teacher and the school, but as of mid May 1985, there were still some of the Christmas decorations up and around in the room. Contrary to his varied lifestyle, things change very little in Mr. Smythe's room.



In this section of the paper I wish to look at patterns of turn taking in a ninth-grade physical science classroom. My beginning question has come to be, "Do all students get an equal chance to ask questions and give responses in class?"

To begin this section of this report and to take that question to task, a look at the daily pattern of class routine should be shown. The reader needs to pay close attention to the opening of the class, as well as the way in which the instruction part of the lesson is handled.

When the third hour class is dismissed one enters Mr. Smythe's room. Over in the front corner of the room behind a desk, that has obviously seen lots of wear and more than one refinishing, sits Mr. Smythe. The teacher has picked up a copy of Newsweek and is busily reading during the passing period between classes. As the students file into the room, few stop to speak to Mr. Smythe. Of those students that do stop, rarely do any of them make eye contact with him due to his concentration during the time of his reading. On the occasions that Mr. Smythe does talk to the students at this time his responses are seldom more than, "Yes.", "No.", "We'll talk about that in class." These responses are given without looking up from his reading.

When the bell rings to signal the beginning of the fourth hour Mr. Smythe closes his magazine and opens his grade book and says, "Okay, find your seats. Answer as I call your name." Mr. Smythe reads down through the names on the class roster and the students answer with "here" or some facsimile. When the roll has been taken, Mr. Smythe shifts gears into the instructional mode.

"Please get out your homework problems from yesterday.", is the quote heard most often at the beginning of the instructional phase of the period. The students shuffle through their papers to find the problems that had been done on the previous day. Mr. Smythe takes his place at the front of the room by the overhead projector. The projector is turned on and the film is rolled back to the place where the problems in question are located. Without much introduction, Mr. Smythe reads the problem and then proceeds to work the problem on the overhead so that each student can see the process, formula, and product of each of the physics problems. During this time Mr. Smythe calls on very few students to give information to the problems, but several students ask questions of him. The students in the closest proximity of his overhead projector seem to be the students that ask the most questions. This pattern of problem and student questioning follows until the problems are finished. Sometimes the papers are collected for homework grades but usually are counted as practice problems. Mr. Smythe lets the students grade their own practice papers so that students can find their mistakes and allow corrections to be made.

The next phase of the usual classroom pattern is the homework phase. Still at the overhead, Mr. Smythe writes problems on the film that the students copy. The problems are usually of a similar type as the problems from the previous day. If any additional information for completion of the problems is needed, Mr. Smythe takes time to make a brief explanation. Usually seven to ten

problems are written, read, and explained. The remainder of the class period is dedicated to working on the problems. At this point Mr. Smythe will do one of two things. His usual pattern is to go back to his desk and read his magazine or to come to my seat and talk to me. His behavior at this time is different from when the students enter at the beginning of the period. Foremost on his mind at this time is answering of student questions. The students must come to him, but he takes as much time as the student needs to get a question answered. This process continues until the period ends. At the end of the period Mr. Smythe does not go back to his desk to read, but instead makes sure that all of the students have exited, locks the door, and goes to lunch.

As shown by this distillation, Mr. Smythe is a creature of habit. I use the word habit after some careful consideration. The reader should not take the usage of the word in its common or derogatory context, but more in the way in which John Dewey (1938) would have used it. Habit in the case of Mr. Smythe means that this pattern of behavior has developed to help him avoid problems and get to his desire. The desire is to get the work done, and the problem is anything that stands between Mr. Smythe and his desire. I believe that his thinking is that by keeping the class on a particular pattern many behavior problems are eliminated. This allows the lesson to flow smoothly. Mr. Smythe's lessons do progress smoothly with hardly ever a variation of the pattern. Classes begin with the students entering, roll is taken, homework is reviewed and checked, the next assignment is given and any new information is explained, and finally the students are allowed to work on their homework and ask questions to Mr. Smythe. Mr. Smythe takes as much time as needed to clear up the questions that the students have.

An example to show the behavior of Mr. Smythe at the beginning of a class session and his apparent indifference to a student is illustrated by an occasion when a student named Chance approached Mr. Smythe to tell him a few details about a movie that he had seen the night before. As I observed this conversation, I was struck with the noticable lack of concern that Mr. Smythe exhibited when approached by the student.

One morning after I had entered Mr. Smythe's class, I exchanged greetings with him and began to get seated and prepare to take field notes. I observed Chance approach Mr. Smythe and attempt to engage in some conversation with him. Chance, obviously eager to share some information with Mr. Smythe, spoke with excitement in his boyish voice.

"You should have seen the movie that my parents and my girlfriend went to see last night." Chance said.

"Hmm," said Mr. Smythe in a very uninterested tone without looking up from his reading.

"It was called 'Mischief' and it had some pretty funny stuff in it like this one part..."

"I'm sure, " said Mr. Smythe even less interested than before.

At this point the bell rang and Mr. Smythe began the daily ritual.

From this brief vignette the reader can see that Mr. Smythe is indeed a person of habit whose main concern between classes is the reading he does for his own enjoyment. This pattern is the predominent one, but in my observations I did see a notable exception.

In this next vignette we introduce Alice. Alice is a special case, or rather an exception to the rule. Pay close attention to how Mr. Smythe behaves when he is approached by Alice in the following vignette.

On one of the days in which I was observing in Mr. Smythe's classroom I watched Alice enter the room. From my location in the back of the room, I saw her walk to Mr. Smythe's desk where he sat reading. Distance did not permit me to understand what she said to him, but I did see him raise his head and return a comment to Alice. This caught my interest to the degree that I left my seat to walk to the front of the room and tune in to their conversation. Alice was talking to Mr. Smythe about a cabin on a lake somewhere in the northern part of the state. It was unusual for Mr. Smythe to engage in conversation with a student before class during his reading time. The conversation continued on as the bell rang to signal the beginning of class. Their conversation continued for a full minute or so past the bell.

I was interested in this discrepant case. On several occasions I had seen Mr. Smythe completely ignore students or answer with monosylables if they approached him during his reading time. On this occasion, not only did he answer Alice, but he took time to engage in a conversation that lasted past the beginning of the period. I asked myself what qualities might Alice posess that would allow her to speak at length to Mr. Smythe when other students were ignored?

As I looked back into the first section of the report I can see that it seems that some students do get more time or attention from the teacher. Being interested in what factors might contribute to a student's desirability, I began to look into this phenomenon by formulating a question to form a starting place for my data collection. My question was; In a certain ninth grade physical science classroom do some students have more verbal exchanges with the teacher, and if so what is the teacher's attraction to certain students? An assertion might be;"The teacher gives more attention to students that will give him the correct answer to a question.", or "The teacher gives more attention to students that he has known from prior experiences." or "The teacher calls on certain girls because they are cute, popular, etc." The latter statement I feel would be next to impossible to measure.

Tobin (1985) and Gallagher (1985) mention cases in which girls are called on in class because they present a positive image, or present an attractive image. I did not think that this would have any application to the classroom that I was studying until one day I arrived to find that the freshman basketball team was to have a pep rally on that same afternoon. In Mr. Smythe's room were four of the six ninth grade cheerleaders, today all in uniform. These students are Alice,

Peterson, Heckel, and DeLucia. I had remembered from observations and in looking at the students as they sat that Alice, Peterson, and Heckel all sit close together in class. (See chart 1) Could it be that Alice gets lots of questions because Mr. Smythe knows that she can answer the questions, but that his eye is also drawn to the location of these three somewhat attractive girls? If my theory was to hold any intellectual water I would assume that on days that there were pep rallies Alice, Heckel, Peterson, and DeLucia would receive the lion's share of the questions. I decided to have a look.

On this day there was not as much questioning as I had wished for. Mr. Smythe began the class period with his usual oral roll call after which he said, "Okay, would you get out yesterday's problems please? We are going to work through these today."

Alice blurted out so that all could hear, "Alls we ever do is problems."

Mr. Smythe looked up at her and smiled and said, "That's what you're here for."

Mr. Smythe had gotten to the second problem in his series on gravity and bouyancy when he made an error in calculation. The problem was the subtraction of seventeen Newtons from twenty Newtons and in his explanation he had said that the answer was three Newtons, but had written two Newtons on the overhead. At this point Frisco raised his hand and said, "That's supposed to be a three, not a two."

Mr. Smythe said, "Seventeen from twenty is three."

Frisco said, "I know but you got two."

Mr. Smythe said, "Oh, I see my mistake."

This seemed to confuse Peterson who sits in front of Alice. She puzzled for a bit and then raised her hand. Mr. Smythe was busy writing the next problem on the overhead and answering questions being asked quietly by the three girls sitting in the immediate vicinity of the overhead projector. He could tell that someone had their hand raised to ask a question, but without looking up he said, "Do you have a question, Alice?"

Alice had been talking to Heckel at the time and was not paying particular attention to the lesson. She was taken off guard and responded by saying, "No." in a confused and somewhat anxious manner.

Peterson raised her hand a bit higher and said, "It was me!"

Mr. Smythe looked up and said, "Oh, I didn't see your hand."

The rest of the period passed with few occurances of anything that was of interest to my work. The only question that was asked by any of the cheerleaders was the question that was raised by Peterson. The only cheerleader interaction that was initiated by Mr. Smythe was when he asked Alice if she had a question. It didn't seem that Mr. Smythe was attracted to the girls because of their uniforms. What did emerge was the fact that Frisco asked several questions during the the period

and almost all of them were of a corrective nature. He would say things, such as, "Don't you mean...", or "Isn't that supposed to be..."

It was also in this class period that I learned a bit about focused observation. I realized that for each minute that I concentrated on Alice and the cheerleaders, I was missing what the girls that sat in the front of the room by the overhead projector were saying.

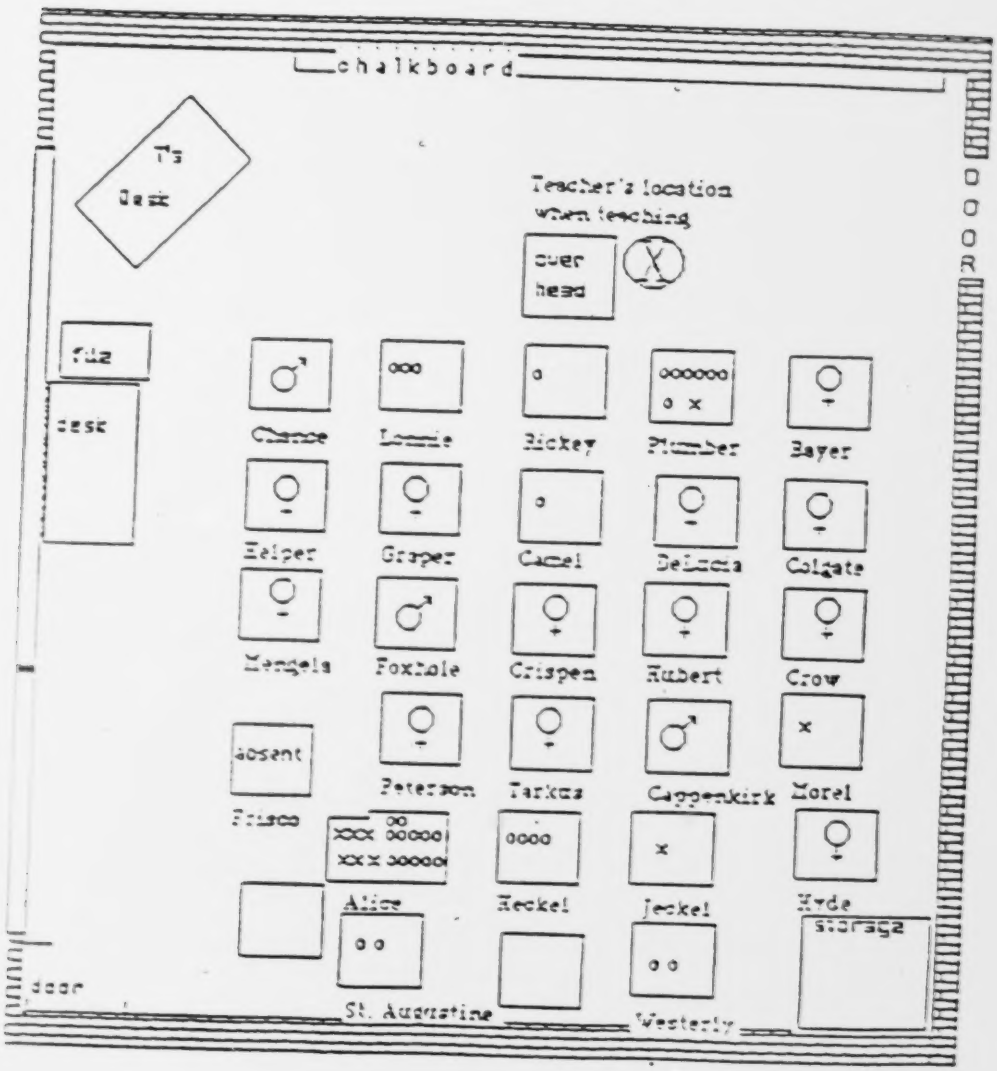
Looking at the situation after observation, I don't think I can put much support into my own idea that Mr. Smythe chooses girls to talk to in class just because they are cheerleaders. Peterson spoke, but she asked a question. Frisco spoke several times, but he is not a cheerleader. The girls in the front of the room asked quite a few questions, but none of them are cheerleaders. In any case, location was staring at me. Instead of teaching to a whole class, was Mr. Smythe teaching to a specific location?

The idea of location was interesting to me. After observing this class I waited until the period was over and planned to have a look around. When Mr. Smythe was leaving for lunch I told him that I would like to remain in his room and write notes for a short time. He agreed and left for lunch.

While I was alone in the room I went to the front, turned on the overhead projector, stood in Mr. Smythe's usual position, and began to write. Out of the corner of my eye I could see the positions of Peterson, Alice, Heckel, and Frisco somewhat more clearly than others. This was due to the glare of the machine. I thought I had found something valuable. Then I realized that I had overlooked something. Mr. Smythe is a full five inches taller than I am. Undaunted, I searched for something to stand on. I settled for two classroom dictionaries. As I tried again from my new vantage point, I saw the same thing as before with one added feature. I could now see the seat that I normally occupy when I come to class to do observations. Could it be that Mr. Smythe was teaching to me and by focusing his attention towards me he was naturally calling on students closest to me so that I could hear their responses a little better and take better notes? Was Mr. Smythe so eager to help me in my study that he was presenting a pattern that was atypical of his usual manner?

After some discussion with a fellow researcher, I decided to change my location in the room in order to check my hunch that Mr. Smythe was teaching to me.

I observed Mr. Smythe's class on two consecutive days. On both of these days I had made arrangements with him to sit in a place that I had not occupied on any day before that time. On the day of the first observation Mr. Smythe was again working out problems on the overhead projector. On this day Mr. Smythe asked a total of thirty-two questions relating directly to the instruction of the lesson. The students on this day asked only nine questions to Mr. Smythe. The patterns and distributions are contained on the following chart.



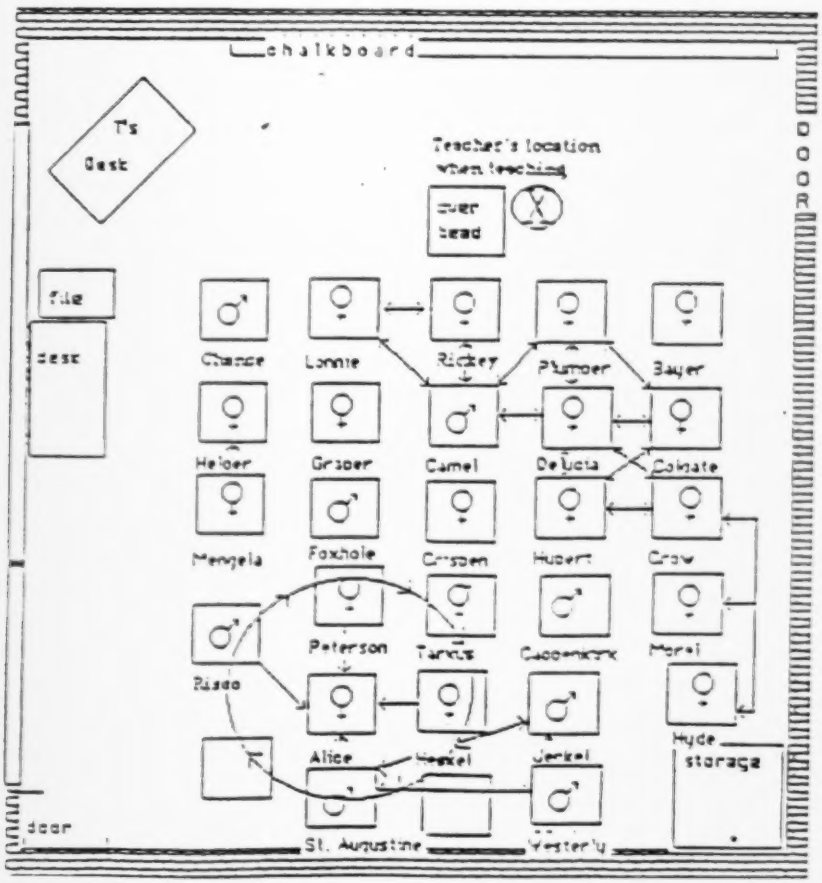
o = Teacher's questions to students

x = Student's questions to the teacher

In this chart the reader can see that the bulk of the questions asked by the teacher went to Alice and Plumber. The teacher asked a total of thirty two questions. Of the thirty-two questions, twelve went to Alice, seven went to Plumber, four went to Heckel, three to Lonnie, two each to St. Augustine and Westerly, and one each to Rickey and Camel.

In this session the students asked only nine questions. Alice asked six, two-thirds of all the questions asked on this day. Jeckel, Morel, and Plumber each asked one question to round out the other third.

On the session that I observed the next day, the plan of the lesson was quite different. On this day, Mr. Smythe made an assignment and asked the students to work for the entire period. Alice asked if students could work together to complete the assignment and Mr. Smythe responded that he thought that it would be acceptable if the students were to work in that fashion.



From looking at this chart there are two distinct sub-communities in operation in the room. One of the groups surrounds Alice, while the other group focuses on or about the position of DeLucia.

Alice's group, from my observations, was indeed working on the assignment as outlined by Mr. Smythe. In this small group, Peterson played a more active role than had been previously observed in the larger setting of the whole class. The pattern of the group was for each student to work the problem at the same time and then compare answers. The most off-task of the group was St. Augustine who spent a considerable amount of time talking with Jeckel and Westerly.

The other group interaction that I observed was centered around DeLucia. This group was much less work-oriented than the other. Most of the student talk was social, but Lonnie, Rickey, and Camel worked consistantly and helped each other work through the most difficult problems.

What does Mr. Smythe have to say about the students? Does Mr. Smythe know each of the students? Maybe that is a factor that I had overlooked. Maybe he doesn't get to know each of the students and that accounts for him calling on such a small number of students. In an interview I asked him to give me a few words to describe each of the students. Here are the results.

When I asked about Chance Mr. Smythe offered no response. This is especially interesting since Mr. Smythe did not respond to Chance in the aforementioned vignette either. Sitting behind Chance in the first row by the window is Helper. "She is one of the best overall students in this class." The next student in that row is Mengela. "She's absent a lot and she seems to be off in a world of her own." The next student in that row is Frisco. "He's a very good student, one of the best overall I'd say."I mentioned to Mr. Smythe that it had appeared to me that Frisco seemed to look for errors in the lesson so that he could correct the teacher. Mr Smythe's reply was, "No, I don't see it like that at all. He's just an agressive student and a stickler for detail."

Row two starts with Lonnie, one of the students that I noted as being a possible target. "She's into sports and does quite well, but she has to work quite hard in here. Science doesn't come as easy as volleyball." Next in that row is Graper. "He's a good science student." Next in the row is Foxhole, but Mr. Smythe wrinkled his face and oscillated his hand and said, "So-so." He offered no other response. With the next student, Peterson, it became obvious that Mr. Smythe liked her. "I had her sister a few years back. Peterson has it all, brains, looks, class, you name it. She's a real social butterfly, but a real good student too. Her boyfriend is one of the smartest kids in the whole ninth grade." The next student in this row is Alice. I was expecting Mr. Smythe to talk on and on about her, but all he said was, "I know Alice's father. She's a good student,but she likes to hear herself talk." Mr. Smythe offered no more information about Alice. The last student in the second row is St. Augustine. Mr. Smythe said, "He's an interseting kid, he tends to be mischievous, but he is inquisitive and a fairly good student."

The third row in the middle of the room begins with Rickey. Mr. Smythe's word were, "You may have noticed that Rickey talks to Lonnie a lot, but they are usually always talking about science." Sitting behind Rickey is Camel. "He's a good kid and he has a solid foundation of knowledge, but he is moody." Sitting directly behind Camel is Crispen. Mr. Smythe summed up Crispen in one word, "Excellent." For the next student, Tarkus, Mr. Smythe could find nothing to say. The last student in the third row is Heckel. Mr. Smythe summed her up as being,"... a good science student and a cheerleader." Row number four starts with Plumber. This girl is a student that I have labled as a possible target student. I pointed out to Mr. Smythe that I had observed her on many occasions having lots of questions and getting called on a lot in class. Mr. Smythe smiled a sick little smile and said, "She's a good enough student, but she has a raspy personality, I don't know if she likes me. I see Plumber much the same way you saw Frisco." Sitting directly behind Plumber is DeLucia. "DeLucia is a cheerleader and she gets in trouble by Plumber a lot because Plumber picks things [the material] up so fast that she spends the rest of her time talking to DeLucia. She [DeLucia] can't pick it up so fast, but she talks to Plumber anyway." Next in this row is Hubert. Again Mr. Smythe just said, "Excellent." Behind Hubert is Cappenkirk, but Mr. Smythe said nothing about this person. The next person in this row is Jeckel. "Jeckel is a good, interesting kid. You know, the kind that you would like to have more of." Finally, in the last position of this row is Westerly, "He's a good science student and a fairly good overall student."

For the last row of the room, the row that contains Bayer, Colgate, Crow, Morel, and Hyde, Mr. Smythe summed it up with one sentence. "These five over by the wall, they're all girls, all of them are weak students, and all of them are just getting by." I am not sure how to interpret this. Does Mr. Smythe know any more about these students or was he tired from the lengthy interview? This statement does shed some light on a possible reason to explain on recorded evidence of these girls ever asking or receiving questions in class.

In looking for patterns to determine the possible link between the target students and Mr. Smythe, I asked another series of questions. The first was, "Of the students in the fourth hour class can you tell me the names of the top five science students?" Mr. Smythe didn't respond right away, but after looking at the seating chart he named Heckel, Westerly, Tarkus, Plumber, and Graper.

My search for information continued by asking Mr. Smythe to name the five best overall students in the fourth hour class. Again he looked at the seating chart and responded with the names of Westerly, Frisco, Peterson, Alice, and Helper.

I asked Mr Smythe to name students in his class that he has had brothers or sisters of in class in past years, thinking that there might be a connection. Sometimes teachers look forward to having kids from the same family if there had been a good experience with the other student in previous

years. There might be some degree of expectation carried over to the next child from the family. Mr. Smythe named Camel, Crow, Crispen, Peterson, and Alice as students that he has also had a brother or sister from the same family.

Since Mr. Smythe is the leader of the Village High School ski club I asked him how many of the students in his fourth hour class were in the ski club just to see if there was a connection between out of class activities and in class questioning behavior. He named Lonnie, Helper, DeLucia, Colgate, Crow, Hubert, Peterson, and Heckel as students that were also in the ski club as well as in the fourth hour class.

I had a series of questions to ask Mr. Smythe about students possibly going to the same church, living in the same neighborhood, and so on, but Mr. Smythe reminded me that he does not live in the town of Village, but some miles away in another town and that each day he commutes.

As this lengthy section shows, Mr. Smythe does know a lot about his students. He could tell me lots more about these students than I would have thought by observing the way he conducts himself in class.

At the outset of this section I want to give a list of target students as determined from observational data collected over a period of fifteen weeks. These students are Graper, Rickey, Plumber, Lonnie, Frisco, and Alice. My criteria for labeling these students as targets is based on the frequency of questions asked to them by Mr. Smythe and also the number of questions that the students ask to the teacher.

From the questions I asked, Mr. Smythe he mentioned Peterson three times. He named the following students two times, Heckel, Westerly, Alice, Helper, and Crow. In chart form the results of the questions that I asked look like this:

Best Science Students	**Best Overall Students**	**Brothers & Sisters**
Heckel	Westerly	Camel
Westerly	Frisco	Crow
Tarkus	Peterson	Crispen
Plumber	Alice	Peterson
Graper	Helper	Alice

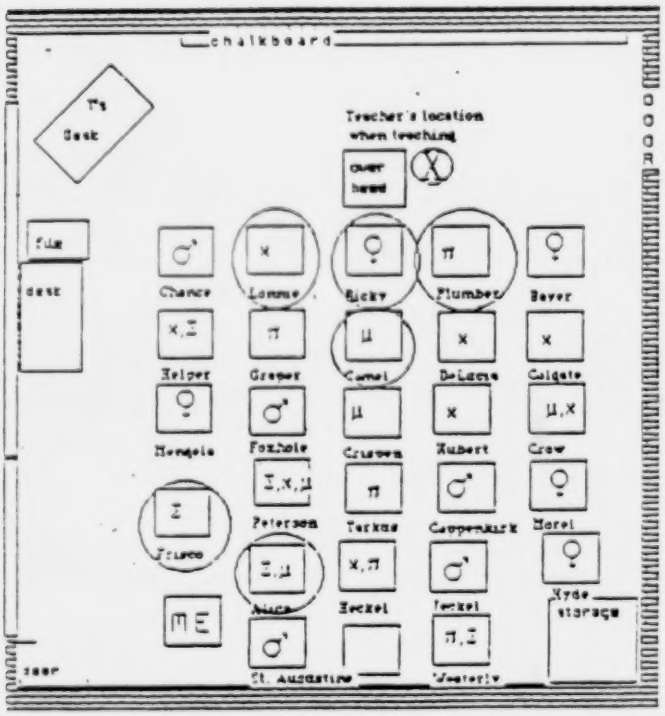
Ski Club
Lonnie
Helper
DeLucia
Colgate
Crow
Hubert
Peterson
Heckel

Targets as defined by observation	
Graper	mentioned once by Mr. Smythe
Rickey	not mentioned
Plumber	mentioned once by Mr. Smythe
Lonnie	mentioned once by Mr. Smythe
Frisco	mentioned once by Mr. Smythe
Alice	mentioned twice by Mr. Smythe

It is unusual in my thinking that Mr. Smythe did not mention Rickey at any point in the discussion of the interview. He spends such a great amount of time talking to her in class that I felt sure that her name would appear. I was also suprised that four of the other targets, as defined by my observations, did not have their names mentioned but once. What we did agree on was not suprising to me. Alice was mentioned two times. There were six students mentioned by Mr. Smythe more than once. Of his six names and my six target students Alice is the only common entry.

The remarkable thing is that of my list of target students and the names that Mr. Smythe gave me of his "top six" (achieved by totaling the responses and counting their frequency) we had only one name in common: Alice.

In the following chart I show a floor plan of the room. In some of the boxes representing a student's position I removed the symbol that indicates whether the student is male or female and placed a symbol that stands for one of the four catagories of students that I asked Mr. Smythe to respond to. For those students that are good science students the symbol "π "was placed in the box. If the student was named as a good overall student the symbol "Σ" was placed in the box. Students that have brothers or sisters that have had Mr. Smythe as a teacher receive the symbol "μ". Finally those students that belong to the ski club are denoted by an "x". The students that I believe to be target students are encircled.



Good Science Student	π
Good Overall Student	Σ
Brothers or sisters	μ
Ski Club	x
My Target Students	Encircled

As one can see when the chart is examined, there seems to be little connection between my target students and the traits that I asked Mr. Smythe to name students to fit into the catagories. As the reader can see, if a target student was based on the four catagories that I outlined, Alice would be the only student that we agreed on. One of my target students, Rickey, doesn't have any of the traits that I asked Mr. Smythe to name.

At this point in my study I was getting quite concerned. I knew that I had something, but I didn't know what. Truly, Alice is a special case. I couldn't think of what the connection was between the amount of attention that was shown to Alice in class and the conditions that allowed it to happen.

Those were confusing days. At one point in the study I stopped looking at my notes and tried to get everything out of my mind so that I could get a fresh start on it at a later time. It seems that I had looked at everything that I had access to. I knew who the top students were, I knew the names of the top overall students, I even knew the names of students that Mr. Smythe had contact before school or by way of an extra-curricular activity. Nothing seemed to fit.

During the time I was analyzing this information, I was involved in teaching a section of general methods for pre-service secondary teachers. In this class my students were struggling with Bloom's Taxonomy. As I sat in my office one day talking to one of my co-workers on the Secondary Schools Science Project I was letting off steam about the poor quality of some of the papers that I had been receiving. I remember my own quote, "It's like their minds haven't progressed past the point of factual recall yet!" As I said the words I paused and reflected on my statement. Was this part of the answer?

Considering the elitist nature of science classes that some writers speak of in which science teachers teach to the eighty-fifth percentile and above, it would seem reasonable that the students that were able to function at this level might posess some higher level reasoning skills that might allow them to answer a more sophisticated question when asked by the teacher.

In order to look at this phenomenon, let us take a look at a vignette in which Alice is called an "expert" by Mr. Smythe.

Mr. Smythe had been teaching about forces of effort in a simple physics chapter of the physical science text. He had assigned a series of problems from the end of unit questions for homework. When the class began he had students get out their homework to review the problems in class. When Mr. Smythe does review work of this kind his common pattern is to use the overhead projector to write out problems, show work, and make diagrams. The first problem was written on the overhead. The problem said, "A pully system with a mechanical advantage of 5 is used to lift a piano with a resistance force of 2000 Newtons into the air. The person pulling on the rope exerts a force of 500 Newtons. How far must the rope be pulled to lift the piano?" Mr. Smythe then asked the class how to do the problem. Several students raised their hands to answer, but only those from the immediate

vicinity of the teacher's location were called upon. Lonnie was first, but she had made a mistake in setting up her problem. Plumber followed, but her answer was incorrect. Rickey tried to answer the question, but became confused and did not finish her answer. None of these students, all girls, could give a correct answer. After three tries Mr. Smythe said, "Well, let's get an expert's opinion."

In the past, there had been occasions in which I had answered questions and volunteered information. I was prepared to answer the question, but instead he said, "Alice, what did you get for this one?"

Without hesitation, Alice answered correctly. In giving her response, she said, "This problem is like something that happened to me and my dad one time. We couldn't lift a boat motor so we used a pully. I found these problems to be easier if I drew a picture." Alice then gave the correct answer. It was as if the entire scene had been rehearsed. Mr. Smythe recognized her answer and complimented her work and started on the next problem.

This scene is somewhat typical of Mr. Smythe's behavior in the fact that he does call upon certain students more than others, but it is atypical in its introduction. Never before had I heard Mr. Smythe refer to Alice as an "expert". It was if he was giving confirming evidence for my assertion to me as a gift. The manner in which Mr. Smythe asked Alice to answer was rather off-the-cuff.

In this fleshed-out vignette one can see that Alice responded in a manner quite different than the others not only be giving a correct answer, but her thinking shows a more complex reasoning ability. When Mr. Smythe was asking for an answer to a question he was looking for a correct response. Basically, through factual recall of information and usage of a specific algorithm. Alice responded in a different way though. Alice's thinking demonstrates not only knowledge of the subject, but also comprehension to see that one situation is much like another. There was some degree of application to her thinking in recognizing that the problem in the book was like a time when she and her father had to lift a heavy object.

With this information about Alice it should seem to fit neatly that the six students that I have labled as targets have similar capabilities when it comes to using higher level reasoning skills to solve problems. But, sadly, it doesn't fit that neatly. Plumber, Frisco, and Alice do demonstrate these higher level abilities. Lonnie, Camel, and Rickey do not. It seems that the only common factor that these six people posess is that they activly pursue the attention of Mr. Smythe by asking questions. I can hypothesize that this pattern may have developed at the beginning of the year and continued on through the present. It is a good way to get the work done.

Doing the job represents a key idea that I wish to discuss in the second part of this report. Lately my thinking has been changing. A new assertion that seems to be forming is, in a certain ninth grade physical science classroom, the teacher views his job differently than the students do.

Mr. Smythe views his job as covering the content. Getting from point A to point B if you will. The students view Mr. Smythe's role as teacher as being one of "helper". Material is presented to which they are passive recipients. This is a conflict in the minds of the parties involved. Examine the following quote. Mr. Smythe has been involved in a science lesson that is not going as well as he had planned. It seems that on this day there are more questions than usual from the three first row students. The topics for the day had been series and parallel circuits. Mr. Smythe seemed to be a bit uneasy today. The overhead projector that he usually works from was out of the room being repaired and he was writing on the chalkboard. One girl in particular was asking lots of questions that centered around the word why. "Why is it that way instead of...?" she would ask. At one point Mr. Smythe said,"Look, I asked Mr. Hollister (another older physical science teacher) about that yesterday and he said,'That's just the way it is', so there you are. That's life." The subject was closed in the mind of Mr. Smythe, but the students on the first row kept asking questions. Mr. Smythe turned around and said in a loud tone, "If the people on the first row would quit asking so many questions and listen , we might get through this. Many of you are asking the same questions over and over again."

In regard to the previous behavior of Mr. Smythe I see a conflict between this quote and the first one. In the first quote Mr. Smythe uses a student to get his lesson moving again after it had stalled. In the next quote Mr. Smythe is being kept from getting the work done by the students on the front row. These students are working at understanding a new concept with little success. In the process of understanding, they are slipping out of their traditional role (or teacher assigned role) of helpers to the teacher to pace the lesson and keep it moving.

The key to this quote is in the understanding of the context. There is a conflict of ideas. Mr. Smythe's view of the target students is that they are a pacing aid. When these target students cannot fill their niche, Mr. Smythe cannot get his work done and he responds, not with anger as it would appear, but with frustration. I believe that Mr. Smythe's view of teaching is a series of tasks that one works through to get to the end. I'm not sure what the end is, nor do I think that Mr. Smythe knows, but this is consistant with my reference to John Dewey in the beginning of this effort.

What does all of this mean? Examining the facts I think I know a couple things for sure. For one, Mr. Smythe does not appear through my observations to have a large body of students that he calls on. There is some indication that the students that he calls on most frequently are not necessarily the best students, but students that demonstrate higher level thinking skills or actively signal that they want to ask questions.

Another interesting finding that the available information seems to point to is the differing viewpoints of Mr. Smythe and the students. There seems to be an indication of an ecology or balance of nature system in the room. The teacher and the students help one another along. When one fails to

help the other, the system breaks down.

In regard to his busy life, I began to see that Mr. Smythe views teaching as a job in much the same way that one works in a factory. One starts work, attacks and finishs a series of tasks to get the work done, and then go home. This could be a reason why he uses the students in his class the way he does.

TEACHING THE FINDINGS

When it came time to share the findings of this research project with Mr. Smythe , I was faced with a problem. How could I share some of the findings with him that were on the bad side of the good news / bad news matrix, (Erickson, 1985)without ruining the rapport that I had worked since September of 1984 to insure? I decided to take a two-pronged approach. The first was to ask him what he wanted to know and then present information that fit into the context of his wants and wishes. After consideration, I thought that this method might meet his wants and wishes, but was I ignoring his needs? What about the needs of the students in his classes? My strategy of "Hope for the best, but prepare for the worst" seemed more like an excuse for not confronting a potential problem than a method of teaching the findings of my research to Mr. Smythe.

On the formal side, Mr. Smythe received a letter of thanks for his help in the research and in the letter it was implied that I would be happy to share the findings of my research with him. The day that the letter arrived happened to coincide with the day that I had planned to do a follow-up interview with Mr. Smythe to see if I had correctly depicted some of the incidents that appeared in the field notes that I had taken in his class.

I went to Mr. Smythe's class to sit in and take notes as I had earlier in the year. I interupted his reading to announce that I was going to be present in the room for the period and he responded by telling me that my letter had arrived and he would like to talk about what I had found. I agreed, and it was decided that the two of us would discuss the findings over lunch.

After class we left his classroom and had a standard issue school lunch in the teacher's lounge of the school. After lunch we settled in to discuss the findings of my project.

I started by presenting Mr. Smythe with a seating chart of the fourth hour class and asked him what he could tell me about certain students on the chart. I followed this discussion with two questions. I asked Mr. Smythe who the top five science students in the fourth hour class were and who the best overall students in the class were. I received some suprises. Several names appeared

on the list that I had never observed talking in class.

I tried to be as diplomatic as possible when I said, "Some of your students in fourth hour talk a lot more than others."

Mr. Smythe misunderstood my statement and thought that I was talking about student misbehavior or off-task behavior.

I cleared this up with him by explaining that a few students seem to share the floor with him. He calls on only a few students and only these students raise their hands to ask questions of him.

Mr. Smythe told me that I was missing the point. The point as he sees it is that when he calls on students he chooses them randomly from among all of the available choices. When students ask him questions, he cannot be held accountable if some students ask more questions than others.

I was faced with a problem. My research, hunches, impressions, feelings, and notes were dismissed as incorrect by Mr. Smythe and yet I had documented evidence of his question and answer patterns in my fieldnotes.

I was thinking of how my perspective on the issue and Mr. Smythe's was different. Mr. Smythe saw his questioning pattern as equitable. It was his belief that if students received more time in the class to speak than others, it was due to the fact that they asked more questions, not that he called on them more than others. My findings do not support that claim. My findings show that Mr. Smythe has a limited body of students that he carries on conversations with, a limited number of students that he calls on in class, and a limited number of students that, perhaps through habit, ask questions to him in class.

When the evidence was shown to Mr. Smythe, his reaction was, "It could be that since you have only observed a few days out of the semester you couldn't see everything that happened. It is probably right for you to make those conclusions based on the information that you gathered."

Playing the part of the naive inductivist I asked myself how many time must I face myself with the same empirical evidence until I am convinced that I am seeing a pattern? How many times must I observe the teacher so that I am certain that I have an accurate representation of what is going on in the setting. I believe that I have made an accurate assessment of the scene, but the information that I have collected is in opposition to the major character in the setting. Who do I believe?

I choose to believe myself. The information that I collected gives every indication of being accurate. The data remains consistant from first observation throughout all others. I put faith in my observations.

With respect to Mr. Smythe I think that he may be fully aware of the information that I

presented to him as being accurate. I can infer that if I were to go back into the scene and observe, that I would not see the same question and answer pattern show up in the class. Mr. Smythe's outward behavior may be one of defense, but I believe that the information that I presented to him has already been internalized and applied. Mr. Smythe thinks highly of himself and his abilities, but for an outsider to point out something to him that could improve his teaching, I feelthat I may have given him too much information for his pride to handle. Therefore, he denied that my information was correct, but probably took what I was saying to heart. A curious twist at the end of the study.

SUMMARY AND CONCLUSIONS

In sifting through the multitude of data that was collected through my field experience it seems that there are three main concerns to be dealt with. First of all, what patterns of turn taking exist in this classroom? Secondly, what is a target student and what qualities determine targetness? The third point from the study is an increased awareness in the perspective of the teacher in the setting. What does the teacher think is going on? How does one get inside the head of the teacher to make sense of a given setting? How does the researcher triangulate his evidence when the viewpoint of the teacher comes into conflict with the evidence gathered during field observations? I wish to address each of these three points in a separate section.

First of all, what is going on here? What patterns of turn taking existed in this ninth-grade physical science classroom? In the beginning I intended to look at signaling. Do students raise their hands or do they call out? It soon became apparent that this was not enough. I found that in this classroom that there were only a few key people that did the talking. On most of the sessions observed the floor was controlled by the teacher, but the questions were divided in an unequal porportion and shared between about six students.

The presence of such a group in the classroom setting is noted in the writings of Tobin,(1985); Tobin and Gallagher,(1985); Dahllof, (1971); Lungren,(1972); and a few others. This group is identified by various names. "Target students" and "steering groups" came to mind. So in regard to previous research I have found nothing new, but only confirming evidence to research done in Western Australia and the United States.

Secondly, in regard to target students and the qualities that determine targetness, I have determined through my observations to have found at least two types of these students. The first

type is the target student that determines himself. The identifying characteristics of these students are their agressive attitudes exhibited towards learning. This is shown through their questioning attitude when new material is presented. These students will not cease to ask questions or allow the lesson to progress until they fully understand the material. A sub-group of the student determined target is the student that asks questions just to talk to the teacher or possibly demonstrate knowledge and gain some praise or approval from the teacher. These students typically ask what could be called good attitude questions. An example of this type of question would be that of a student who would, after a long explanation by the teacher say something to the effect of, "So what you are saying is...?" or "Oh I get it! So you mean that...?"

The next type of target student is the teacher determined. These students are those that may or may not actively pursue questions in whole class discussion, but seem to get questions at any time that the opportunity arises. I had speculated that the teacher might use these students to keep the lesson flowing when it bogged down. I have a hunch that there is something to this idea, but based on my evidence from this study I cannot make any firm assertions. There are probably several contributing factors to the student being a desirable target for the teacher only a few of which were touched on in this look into the classroom setting. One of the major contributing factors to a student's targetness surely appears to be a higher level cognitive reasoning ability. Certainly more research needs to be done in this direction.

Critical to the statement about not being able to make any firm assertions about the use of target students for lesson pacing is the last point that needs discussion. The individual sense-maker's view of the world. Why was it that I viewed Mr. Smythe's classroom routine as being different from his idea of what was going on. Clearly through observation it became clear to me that the bulk of the questions in the classroom were targeted toward a group of about six students. From my vantage point, these six students seemed to be the most intelligent in the room. What I discovered through interviews and discussions with Mr. Smythe was that the list of good science students and good overall students contained names that had appeared nowhere in my field notes with the exception of roll calls and seating charts.

Clearly, if I were to continue this study, which I probably will under the direction of the Secondary Schools Science Project, I would spend a great deal of time getting to know Mr. Smythe and more about his insights and his approach to teaching. Does he view teaching as an art form, a craft, a skill, a science, or is teaching only what he does from eight until three each day for nine months out of the year?

In summary, I should mention that at the outset of this project I did not understand quite how answers led to more questions. Now it is quite clear to me when I view the long and winding path that I have traveled after starting with a very simple question. My ending point for now goes back to how ethnography was originally explained to me.. What is going on here? What lies behind it?

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